

IDENTIFICATION

PRODUCT CODE: MAINDEC-8E-DEGC-D
PRODUCT NAME: RANDOM DCA TEST
DATE CREATED: JUNE 11, 1971
MAINTAINER: DIAGNOSTIC GROUP
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1. ABSTRACT

THIS PROGRAM TESTS THE DCA INSTRUCTION OF THE PDP-8/E. THE DCA INSTRUCTION ADDRESS, OPERAND ADDRESS, AND OPERANDS ARE TAKEN FROM A RANDOM NUMBER GENERATOR.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-8/E EQUIPPED WITH TELETYPE.

2.2 STORAGE

THE DIAGNOSTIC PROGRAM IS STORED IN LOCATIONS 0000 THROUGH 0407. THE PROGRAM USES 0410 THROUGH 7600 FOR A TEST AREA. THE BINARY LOADER MUST BE STORED IN THE LAST MEMORY PAGE.

2.3 PRELIMINARY PROGRAMS

MAINDEC-8E-D0A(N), AND MAINDEC-8E-D0B(N)

3. LOADING PROCEDURE

3.1 METHOD

THE STANDARD BINARY LOADER IS USED.

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

SR0 (0) HALT AFTER ERROR PRINTOUT.
SR1 (1) BYPASS ERROR PRINTOUT
SR2 HOLD "FROM" CONSTANT (1). SELECT RANDOM "FROM" (0).
SR3 HOLD "OPERAND ADDRESS" CONSTANT (1). SELECT RANDOM "OPERAND ADDRESS" (0).
SR4 HOLD "OPERAND" CONSTANT (1). SELECT RANDOM "OPERAND" (0).

4.2 STARTING ADDRESS

0200

4.3 OPERATOR ACTION

1. SET SR TO 0200.
2. PRESS LOAD ADDRESS
3. SET SR TO 0000
4. PRESS CLEAR THEN CONTINUE

5. OPERATING PROCEDURE

SAME AS SECTION 4.

6. ERRORS

6.1 ERROR PRINTOUTS

F XXXX A YYYY O NNNN
L RRRR C MMMM
E

FROM, F XXXX WHERE XXXX = ADDRESS OF THE DCA
INSTRUCTION
ADDRESS, A YYYY WHERE YYYY = ADDRESS WHERE DCA WILL
DEPOSIT OPERAND
OPERAND O NNNN WHERE NNNN = THE OPERAND TO BE DEPOSITED.
LOCATION, L RRRR WHERE RRRR = A NONZERO LOCATION SOME-
WHERE IN THE TEST FIELD.
CONTENTS, C MMMM WHERE MMMM = CONTENTS OF LOCATION RRRR.
END, E THIS LETTER IS TYPED TO INFORM THAT THE
ENTIRE TEST AREA HAS BEEN SEARCHED FOR
NONZERO OPERANDS.

EXAMPLES

A. THE FOLLOWING IS A TYPICAL ERROR PRINTOUT:

```

F 4572 A 0205 0 2525
L 0205 C 2527
E

```

LINE 1 IS SIMPLY A STATEMENT OF THE PROBLEM. IT SAYS THAT A DCA INSTRUCTION LOCATED AT 4572 TRIED TO DEPOSIT THE OPERAND 2525 INTO LOCATION 0205.

LINE 2 SAYS THAT INSTEAD OF FINDING A 2525 IN LOCATION 0205, THE PROGRAM FOUND A 2527. BIT 10 WAS "PICKED UP." THE E SIGNIFIES THAT A SEARCH OF THE TEST AREA SHOWED ONLY THE ABOVE PRINTED LOCATIONS DIFFERING FROM WHAT THEY SHOULD BE.

B. THE FOLLOWING IS A TYPICAL ERROR PRINTOUT:

```

F 4572 A 0205 0 2525
L 0215 C 2525
E

```

LINE 1 IS A STATEMENT OF THE PROBLEM AS IN THE PREVIOUS EXAMPLE. LINE 2 SAYS THAT LOCATION 0215 CONTAINS 2525, AND THE E ON LINE 3 SAYS THAT NO OTHER LOCATIONS WERE DISTURBED. IT IS APPARENT THEN THAT THE DCA INSTRUCTION DEPOSITED ITS OPERAND NOT INTO LOCATION 0205, BUT INTO LOCATION 0215. BIT 8 WAS "PICKED UP".

6.3 ERROR RECOVERY

TO ENTER A SCOPE MODE LOOP, SET SR0 TO A 0. WHEN A HALT OCCURS FOLLOWING AN ERROR, SET SWITCHES 1, 2, 3, AND 4 AND PUSH CONTINUE. A SCOPE MODE LOOP IS ENTERED USING THE CONDITIONS DESCRIBED BY THE LAST ERROR PRINTOUT.

IF IT IS DESIRED TO ENTER A SCOPE MODE LOOP USING A SPECIFIC SET OF CONDITIONS, STOP THE PROGRAM AND MAKE THE FOLLOWING ENTRIES:

- A. ENTER DESIRED FROM ADDRESS INTO MEMORY LOCATION 0167.
- B. ENTER DESIRED OPERAND ADDRESS INTO MEMORY LOCATION 0166.
- C. ENTER DESIRED OPERAND INTO MEMORY LOCATION 0170.

RESTART THE PROGRAM USING A CONTROL SWITCH SETTING OF 3600.

7, RESTRICTIONS (NONE)

8, MISCELLANEOUS

8.1 EXECUTION TIME

3904 RANDOM TESTS/PASS
7 PASSES/BELL
27,328 RANDOM TESTS/PASS

9, PROGRAM DESCRIPTION

MEMORY LOCATIONS 0410 THROUGH 7600 ARE DESIGNATED AS TEST LOCATIONS, AND ZEROES ARE DEPOSITED INTO EACH AT THE BEGINNING OF THE PROGRAM. THE PROGRAM NOW SELECTS A LOCATION FOR THE DCA INSTRUCTION. THIS SELECTED LOCATION MAY BE SPECIFIED OR RANDOM, DEPENDING UPON THE SWITCH REGISTER SETTING. THE OPERAND AND OPERAND ADDRESS ARE SELECTED IN A SIMILAR MANNER. THE PROGRAM NOW JUMPS TO THE TEST DCA, PERFORMS THE INSTRUCTION, THEN JUMPS BACK TO A CHECKING ROUTINE. THE CHECKING ROUTINE VERIFIES THAT THE OPERAND WAS DEPOSITED CORRECTLY. IF AN ERROR IS DETECTED, THE ERROR ROUTINE SEARCHES THE TEST AREA AND PRINTS THE CONTENTS OF ANY NONZERO LOCATION EXCEPT FOR THE TEST DCA INSTRUCTION. UPON COMPLETION OF THIS SCAN THROUGH THE TEST AREA, AN E IS PRINTED AND A NEW TEST IS BEGUN.

THE TELETYPE BELL RINGS AFTER 7 PASSES OF 3904 TEST/PASS.

```

/RANDOM DCA TEST
/SR0(0)=HALT ON ERROR
/SR1(1)=NO PRINTOUTS
/SR2(1)=CONSTANT FROM
/SR3(1)=CONSTANT OPERAND ADDRESS
/SR4(1)=CONSTANT OPERAND
*0

```

```

0000 0000
0001 5001
0002 0002
0003 0003
0004 0000
0005 0000
0006 7771
0007 0400
0010 0000
0011 0000
0012 0300
0013 0207
0014 0003

```

```

0 JMP 1
2
3
0
0
CNT2, 7771
PSUB, SUB
WORK, 0
CNT, 0
M7500, -7500
BEL, 207
THREE, 3

```

```

/CLEAR MEMORY
*20

```

```

0020 0020
0021 1175
0022 3010
0023 3410
0024 1010
0025 7041
0026 1174
0027 7640
0028 5022

```

```

START, TAD LIMLO
DCA WORK
DCA I WORK
TAD WORK
CIA
TAD LIMHI
SEA CLA
JMP START+2

```

```

/CHECK FOR CONSTANT FROM
CK1, LAS
RTL
SPA
JMP CK2

```

```

0030 7604
0031 7006
0032 7510
0033 5052

```

```

/GET FROM ADDRESS
JMS GENRAN
DCA FROM

```

```

0034 4154
0035 3167

```

```

0036 1167
0037 7510
0040 5046
0041 7041
0042 1175
0043 7710
0044 5052
0045 5034
0046 7041
0047 1174
0050 7710
0051 5034

```

```

TAD FROM
SPA
JMP .+6
CIA
TAD LIMLO
SPA CLA
JMP CK2
JMP CK1+4
CIA
TAD LIMHI
SPA CLA
JMP CK1+4

```


/CHECK FOR CONSTANT OPERAND ADDRESS
CK2,

0052 7604
0053 7006
0054 7004
0055 7510
0056 5075

LAS
RTL
RAL
SPA
JMP CK3

/GET OPERAND ADDRESS
JMS GENRAN
DCA OPAD

0061 1166
0062 7510
0063 5071
0064 7041
0065 1175
0066 7710
0067 5075
0070 5057
0071 7041
0072 1174
0073 7710
0074 5057

TAD OPAD
SPA
JMP .+6
CIA
TAD LIMLO
SPA CLA
JMP CK3
JMP CK2+5
CIA
TAD LIMHI
SPA CLA
JMP CK2+5

/CHECK FOR CONSTANT OPERAND
CK3,

0075 7604
0076 7006
0077 7006
0100 7710
0101 5104

LAS
RTL
RTL
SPA CLA
JMP CK4

/GET OPERAND
JMS GENRAN
DCA OPER

0102 4154
0103 3170

/CHECK FOR FROM+1=OPERAND ADDRESS
/CHECK FOR FROM=OPERAND ADDRESS
CK4,

0104 1167
0105 7041
0106 1166
0107 7450
0110 5030
0111 7041
0112 7040
0113 7650
0114 5030

TAD FROM
CIA
TAD OPAD
SNA
JMP CK1
CIA
CMA
SNA CLA
JMP CK1

/PLACE THE INSTRUCTIONS

0115 1171
0116 3567
0117 1167
0120 7001
0121 3173
0122 1172

TAD DCA1
DCA I FROM
TAD FROM
IAC
DCA FROMP1
TAD JMP1

DCA I FROMP1
TAD OPER
NOP
JMP I FROM
HLT
/GO OUT TO TEST
/JMP FAILURE

/RETURN FROM TEST
BACK, TAD I OPAD
CIA
TAD OPER
SZA CLA
JMS I AERR
DCA I OPAD
DCA I FROM
DCA I FROMP1

/RING BELL AFTER 7 PASSES OF 3904 TEST PER PASS

TAD CNT
IAC
DCA CNT
TAD CNT
TAD M7500
SZA CLA
JMP CK1
DCA CNT
ISZ CNT2
JMP CK1
JMS I PSUB
JMP CK1

/RANDOM NUMBER GENERATOR

GENRAN, 0
CLA
TAD RANUM
RAL CLL
SEL
TAD THREE
DCA RANUM
TAD RANUM
JMP I GENRAN
RANUM, 2525

/CONSTANTS AND VARIABLES

OPAD, 3000
FROM, 3001
OPER, 2525
DCA1, DCA I OPAD
JMP1, JMP BACK
FROMP1, 3002
LIMHI, 7600
LIMLO, 410
WORK1, 0
AERR, ERR

0123 3573
0124 1170
0125 7000
0126 5567
0127 7402

0130 1566
0131 7041
0132 1170
0133 7640
0134 4577
0135 3566
0136 3567
0137 3573

0140 1011
0141 7001
0142 3011
0143 1011
0144 1012
0145 7640
0146 5030
0147 3011
0150 2006
0151 5030
0152 4407
0153 5030

0154 0000
0155 7200
0156 1165
0157 7104
0160 7430
0161 1014
0162 3165
0163 1165
0164 5554
0165 2525

0166 3000
0167 3001
0170 2525
0171 3566
0172 5130
0173 3002
0174 7600
0175 0410
0176 0000
0177 0201

```
0200 *200 /DCA ERROR, CHECK ALL MEMORY
0200 JMP START
0201 ERR,
0202 0
0203 LAS
0204 RAL
0205 SPA CLA
0206 JMP I ERR
0207 JMS PHD
0208 TAD LIMLO
0209 DCA WORK
0210 TAD I WORK
0211 SZA CLA
0212 JMS ER1
0213 TAD WORK
0214 CIA
0215 TAD LIMHI
0216 SZA CLA
0217 JMP -7
0218 TAD E
0219 JMS PRINT
0220 TAD CR
0221 JMS PRINT
0222 TAD LF
0223 JMS PRINT
0224 LAS
0225 SMA CLA
0226 HLT
0227 /HALT ON ERROR
0228 JMP I ERR
0229
0230 /MEMORY LOCATION WRONG (MAYBE)
0231 ER1,
0232 0
0233 TAD WORK
0234 CIA
0235 TAD FROM
0236 SNA CLA
0237 JMP I ER1
0238 TAD WORK
0239 CIA
0240 TAD FROMP1
0241 SNA CLA
0242 JMP I ER1
0243 TAD L
0244 JMS PRINT
0245 TAD WORK
0246 JMS TYPAC
0247 TAD WORK
0248 DCA WORK1
0249 TAD C
0250 JMS PRINT
0251 TAD I WORK1
0252 JMS TYPAC
0253
0254 /FORGET IT. THIS IS LOC FROM
0255 /FORGET IT. THIS IS LOC FROM+1
0256
0257
```


0260 1375
0261 4351
0262 1376
0263 4351
0264 5633

TAD CR
JMS PRINT
TAD LF
JMS PRINT
JMP I ER1

/PRINT FIRST LINE OF ERROR

0265 0000
0266 7200
0267 1367
0270 4351
0271 1167
0272 4310
0273 1371
0274 4351
0275 1166
0276 4310
0277 1377
0300 4351
0301 1170
0302 4310
0303 1375
0304 4351
0305 1376
0306 4351
0307 5665

PHD, 0
CLA F
TAD F
JMS PRINT
TAD FROM
JMS TYPAC
TAD A
JMS PRINT
TAD OPAD
JMS TYPAC
TAD O
JMS PRINT
TAD OPER
JMS TYPAC
TAD CR
JMS PRINT
TAD LF
JMS PRINT
JMP I PHD

/TYPE AC CONTENTS IN OCTAL

0310 5310
0311 3366
0312 1366
0313 7012
0314 7010
0315 3365
0316 1365
0317 7012
0320 7010
0321 3364
0322 1364
0323 7012
0324 7010
0325 3363
0326 1370
0327 4351
0330 1357
0331 3360

TYPAC, JMP
DCA SAVE+3
TAD SAVE+3
RTR
RAR
DCA SAVE+2
TAD SAVE+2
RTR
RAR
DCA SAVE+1
TAD SAVE+1
RTR
RAR
DCA SAVE
TAD SPACE
JMS PRINT
TAD FOUR
DCA CTR

0332 1363
0333 0361
0334 1362

LUP, TAD SAVE
AND MSK7
TAD TW6

0335	4351	JMS PRINT
0336	1364	TAD SAVE+1
0337	3363	DCA SAVE
0340	1365	TAD SAVE+2
0341	3364	DCA SAVE+1
0342	1366	TAD SAVE+3
0343	3365	DCA SAVE+2
0344	2360	ISE CTR
0345	5332	JMP LUP
0346	1370	TAD SPACE
0347	4351	JMS PRINT
0350	5710	JMP I TYPAC
0351	0000	0
0352	6046	TLS
0353	6041	TSF
0354	5353	JMP -1
0355	7200	CLA
0356	5751	JMP I PRINT

PRINT,

/CONSTANTS

0357	7774	FOUR,	-4
0360	0000	CTR,	0
0361	0007	MSK7,	7
0362	0260	TW6,	0260
0363	0000	SAVE,	0
0364	0000		0
0365	0000		0
0366	0000		0
0367	0306	F,	306
0370	0240	SPACE,	240
0371	0301	A,	301
0372	0314	L,	314
0373	0303	O,	303
0374	0305	E,	305
0375	0215	CR,	215
0376	0212	LF,	212
0377	0317	O,	317

0400	0000	4400	
0401	1207	SUB,	
0402	3006		0
0403	1013	TAD PASS	
0404	6046	DCA CNT2	
0405	7200	TAD BEL	
0406	5600	TLS	
0407	7771	CLA	
		JMP I SUB	
		7771	
		PASS,	
		S	

